REMARKS/ARGUMENTS

Claims 1, 3-15, and 17-30 are pending in the application. Claims 1 and 15 are amended herein. The Applicant hereby requests further examination and reconsideration of the application in view of the foregoing amendments and these remarks.

Claim Rejections and Allowable Subject Matter

In paragraph 4 of the office action, the Examiner rejected claims 1, 3-4, 6-15, 17-18, and 20-28 under 35 U.S.C. 103(a) as being unpatentable over Shinomiya in view of Arslan. In paragraph 5, the Examiner objected to claims 5 and 19 as being dependent upon a rejected base claim, but indicated that those claims would be allowable if rewritten in independent form. In paragraph 6, the Examiner allowed claims 29 and 30. For the following reasons, the Applicant submits that all of the pending claims are allowable.

Claims 1 and 15

Claim 1 has been amended to further clarify differences between the claimed invention and the teachings of the prior art.

According to currently amended claim 1, one or more demands for service are received in a mesh network comprising a plurality of nodes interconnected by a plurality of links. A threshold is specified corresponding to a maximum number of failure-related cross-connections at a node in the network. Each of the one or more demands is mapped onto a primary path and a restoration path in the network to generate a path plan for the one or more demands in the network. Reduction of a portion of restoration time associated with failure-related cross-connections in the network is taken into account during the mapping. The mapping generates the path plan based on the specified threshold such that, for all nodes in the mesh network, the number of failure-related cross-connections at each node is no more than the specified threshold.

In addition to explicitly reciting that the number of failure-related cross-connections in a network is a maximum number of failure-related cross-connections at a node in the network, claim 1 has also been amended to recite that the number of failure-related cross-connections at each node is no more than the specified threshold, rather than being "less than" the specified threshold. This latter amendment is made to prevent circumvention of the claimed invention by implementing a method that enables the number to be less than or equal to the specified threshold.

In rejecting claim 1, the Examiner admitted, on page 2, that Shinomiya does not disclose:

"o specifying a threshold corresponding to a number of failure-related cross-connections; and

o reduction of a portion of restoration time associated with failure-related cross-connections in the network is taken into account during the mapping,

- based on the specified threshold such that, for all nodes in the mesh network, the number of failure-related cross-connections at each node is no more than the specified threshold."

Instead, the Examiner stated that Arslan teaches the features of claim 1 that are missing from Shinomiya, citing column 5, line 13-27, and column 14, lines 45-60, of Arslan. For the following reasons, the Applicant submits that claim 1 is allowable over the cited references.

The Examiner Mischaracterized the Claimed Invention or Arslan or Both

Claim 1 explicitly recites that "the number of failure-related cross-connections at each node is no more than the specified threshold" (emphasis added).

Arslan teaches a system for restoration of communications networks. According to column 5, lines 4-8, a CIRCUIT_STATE element, which is a description of a circuit, includes parameters for each circuit such as the number of segments limit. According to column 5, lines 20-23, the number of segments limit specifies the maximum number of cross-connections that are permitted to be employed when provisioning or restoring the circuit. Column 3, lines 34-36, explicitly defines a circuit in a network 100 as "an end-to-end bi-directional connection to interconnect elements outside of network 100."

In view of these explicit teachings, it is clear that, as used in Arslan, the term "maximum number of cross-connections" refers to the maximum number of cross-connections in a circuit, where the term "circuit" is equivalent to the term "path" in the present application.

As known in the art, the term "cross-connection" refers to the routing of a signal from one link to another link at a cross-connecting node that forms a common endpoint of the two links. Assume, for example, a path (i.e., Arslan's "circuit") consisting of links l1, l2, l3, l4, and l5, where links l1 and l2 are connected by node n1, links l2 and l3 are connected by node n2, links l3 and l4 are connected by node n3, and links l4 and l5 are connected by node n4. Such a path has four cross-connections, i.e., one at each node interconnecting a different pair of links of the path. In general, the more cross-connections in a path, the longer it takes to set up the path.

A node in mesh network can be part of a number of different paths. For each path for which the node is an intermediate node (as opposed to a source node or a destination node), the node provides a cross-connection for that path. Thus, in theory, a node can provide a plurality of cross-connections for a plurality of different paths.

Arslan teaches the use of a maximum number of cross-connections that are permitted in a single path (i.e., Arslan's "circuit"). This effectively limits the length of a path to a specified number of cross-connecting nodes. For example, if the maximum number of cross-connections in a single path is five, then no path in Arslan's network can have more than five interconnecting nodes, which is another way of saying that the path cannot be more than six links long. Since longer paths take longer to set up, by limiting the allowable number of cross-connections, Arslan effectively limits the amount of time that it takes to recover from a failure.

Claim 1, on the other hand, does not recite that the number of cross-connections in a single path are limited. Rather, according to claim 1, the number of cross-connections at a node are limited. This is very different from limiting the number of cross-connections in a single path. In particular, limiting the number of cross-connections at each node in a network does not limit the number of cross-connections in any path in the network. As long as the number of cross-connections at each node in a network is within a specified threshold, there is no limit to the number of cross-connections in any path in such a network.

Limiting the number of cross-connections at a node in a network is equivalent to limiting the number of different paths for which the node is an intermediate node. For example, if the maximum number of cross-connections at each node is five, then no node in the network can have more than five paths passing through it. Note that, as long as no node has more than five paths passing through it, there is no limit to the number of cross-connections in any path in the network.

The Applicant suspects that the Examiner may even have recognized these differences between the teachings in Arslan and the claimed invention. The Applicant notes that, in characterizing the teachings in Arslan, the Examiner stated that Arslan "specifies the maximum number of cross-connections." Significantly, the Examiner did not state that Arslan "specifies the maximum number of cross-connections at each node."

To the extent that, in reality, the teachings of Arslan are different from the claimed invention, and to the extent that the Examiner at least suggested that they are not different, the Applicant submits that the Examiner mischaracterized the teachings in Arslan or mischaracterized the claimed invention or both in rejecting claim 1. As such, the Applicant submits that the rejection of claim 1 is improper and should be withdrawn.

The Combination of Shinomiya and Arslan Does Not Provide the Claimed Invention

Independent of any mischaracterizations, the fact remains that the combination of teachings in the cited references does not provide the claimed invention. At most, such a combination would provide a method comprising, among other things, the step of specifying a threshold corresponding to a number of failure-related cross-connections in each path (i.e., Arslan's "circuit") in a network, where the number of failure-related cross-connections in each path is no more than the specified threshold. This is different from the invention of currently amended claim 1, which explicitly recites the step of "specifying a threshold corresponding to a maximum number of failure-related cross-connections at a node in the network, ... wherein ... for all nodes in the mesh network, the number of failure-related cross-connections at each node is no more than the specified threshold.

Since the combination of Shinomiya and Arslan fails to provide the invention of claim 1, the Applicant submits that this provides yet another reason for the improperness of the rejection of claim 1.

Claims 1 and 15 are Allowable

In view of the foregoing, the Applicant submits that currently amended claim 1 is allowable over the cited references. For similar reasons, the Applicant submits that currently amended claim

15 is allowable over the cited references. Since claims 3-14 and 17-28 depend directly or indirectly from claims 1 and 15, it is further submitted that those claims are also allowable over the cited references.

Claims 3 and 17

According to claim 3, the mapping results in a maximum number of failure-related cross-connections at all nodes in the network being within a specified tolerance of a theoretical minimum. In rejecting claim 3, the Examiner admitted that Shinomiya does not disclose this feature of claim 3. Instead, the Examiner stated that Arslan teaches this feature of claim 3 missing from Shinomiya, citing column 5, lines 13-27, and column 10, lines 11-26, of Arslan. Here, too, the Examiner submits that the Examiner mischaracterized either the teachings in Arslan or the claimed invention or both.

As described above in relation to claim 1, Arslan's passage at column 5, lines 13-27, is related to the number of cross-connections in a path, not to the number of cross-connections at a node. Furthermore, the minimax factor described in column 10, lines 11-26, relates to the number of spare channels available between each node in a path and the next node in the path to which it connects. See, e.g., column 10, lines 15-19. The number of spare channels in a link connecting two nodes in a network is very different from the number of cross-connections at a node in a network. To the extent that the Examiner suggested that these concepts are not different, the Applicant submits that the Examiner again mischaracterized either the teachings of Arslan or the claimed invention or both.

The Applicant submits that this provides additional reasons for the allowability of claim 3 and similarly of claim 17, and therefore claims 4-5 and 18-19, which depend variously from claims 3 and 17, over the cited references.

Claims 4 and 18

According to claim 4, a graph-theoretic condition is used to derive the theoretical minimum. In rejecting claim 4, the Examiner cited column 6, lines 52-55, and column 8, lines 47-52, of Shinomiya.

The passage at column 6, lines 52-55, relates to the distribution condition and communication capacity of a working communication route. There is no mention of using a graph-theoretical condition to derive a theoretical minimum for the number of failure-related cross-connections at a single node.

The passage at column 8, lines 47-52, relates to the deletion of (i) nodes that exceed the upper limit of restoration time and (ii) links that have no sharable spare wavelengths. Here, too, there is no mention of using a graph-theoretical condition to derive a theoretical minimum for the number of failure-related cross-connections at a single node.

The Applicant does not understand how the Examiner can (accurately) admit, as on page 3, that Shinomiya does not disclose "specifying a threshold corresponding to a number of failure-

related cross-connections," and then argue on page 4 that Shinomiya somehow teaches the use of a graph-theoretic condition to derive the theoretical minimum, within a specified tolerance of which exists a maximum number of failure-related cross-connections at all nodes in a network. The Applicant submits that the Examiner cannot have it both ways.

As described in response to the first office action, Shinomiya does not even suggest a theoretical minimum for any parameter, let alone using a graph-theoretic condition to derive a theoretical minimum for the number of failure-related cross-connections at a single node.

The term "graph-theoretical" is a term of art that, in the context of the present invention, refers to the analysis of a real-world communication network using graph theory. Shinomiya does not teach or even suggest such analysis.

The Applicant submits that this provides additional reasons for the allowability of claim 4 and similar of claim 18, and therefore claims 5 and 19, which depend from claims 4 and 18, over the cited references.

Claims 6 and 20

According to claim 6, the mapping sequentially evaluates each possible path plan for each of the one or more demands and selects the path plan having a smallest maximum number of failure-related cross-connections. In rejecting claim 6, the Examiner admitted that Shinomiya does not teach the latter feature. Instead, the Examiner stated that Arslan teaches this feature of claim 6 missing from Shinomiya, citing column 5, lines 13-27, and column 10, lines 11-26, of Arslan.

For the same reasons given earlier regarding the passages at column 5, lines 13-27, and column 10, lines 11-26, the Applicant submits that the Examiner once again mischaracterized the teachings of Arslan or the claimed invention or both.

The Applicant submits that this provides additional reasons for the allowability of claim 6 and similarly of claim 20 over the cited references.

Claims 7 and 21

According to claim 7, the mapping comprises (1) selecting two node-disjoint paths for each demand, wherein leveling of link loads is taken into account during the selecting, and (2) for each demand, identifying one of the two node-disjoint paths as the primary path and the other as the restoration path, wherein a maximum number of failure-related cross-connections at all nodes in the network is taken into account during the identifying.

In rejecting claim 7, the Examiner admitted that Shinomiya does not teach the latter feature. Instead, the Examiner stated that Arslan teaches this feature of claim 7 missing from Shinomiya, citing column 5, lines 13-27, of Arslan. For the same reasons given earlier regarding the passage at column 5, lines 13-27, the Applicant submits that the Examiner once again mischaracterized the teachings of Arslan or the claimed invention or both.

The Applicant submits that this provides additional reasons for the allowability of claim 7 and similarly of claim 21 over the cited references.

Conclusion

For the reason set forth above, the Applicant submits that the rejections of claims 1, 3-4, 6-15, 17-18, and 20-28 under Sections 103(a) have been overcome.

In view of the above remarks, the Applicant believes that the now-pending claims are in condition for allowance. Therefore, the Applicant believes that the entire application is now in condition for allowance, and early and favorable action is respectfully solicited.

Respectfully submitted,

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